

## NOZZLE ASSEMBLY WITH EDGE CLEANING THROUGH AGITATOR CAVITY

This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/450,274 filed on February 27, 2003.

### Technical Field

The present invention relates generally to the floor care equipment field and, more particularly, to a nozzle assembly incorporating a unique edge cleaning duct and to a vacuum cleaner equipped with such a nozzle assembly.

### Background of the Invention

Floor care cleaning equipment such as canister vacuum cleaners and upright vacuum cleaners have long been known in the art. Such 10 vacuum cleaners incorporate a fan and motor assembly that generates negative air pressure to draw dirt and debris into the vacuum cleaner.

Many incorporate rotary agitators that beat dirt and debris from the nap of an underlying carpet or floor in order to provide additional cleaning action. Entrained dirt and debris is removed from the airstream and collected in a dirt collection vessel such as a dirt cup or dust bag of porous filter material. Some vacuum cleaners rely strictly upon filters to clean the dirt and debris from the airstream while others also utilize cyclonic airflow principles.

During the use of a vacuum cleaner it is often necessary to clean along walls or a toe strip, up against cabinets or along toe plates as well as along the sides of furniture. The present invention relates to a nozzle assembly incorporating a unique edge cleaning duct that improves the cleaning performance of a vacuum cleaner in these types of situations.

#### Summary of the Invention

15 In accordance with the purposes of the present invention as described herein, a nozzle assembly is provided for a vacuum cleaner. The nozzle assembly comprises a housing including a main cavity and at least one intake opening in fluid communication with the main cavity. Additionally, the nozzle assembly includes an edge cleaning duct having

20 an inlet adjacent an edge of the housing and an outlet in fluid communication with the main cavity.

In accordance with additional aspects of the present invention the inlet is discrete from the main cavity. Further, an agitator is provided in the main cavity. The agitator is mounted for rotation relative to the

housing. Additionally, the housing has a first section and a second section. The second section nests with the first section. Additionally, the first section includes a first channel defined by a first series of walls. The second section includes a second channel defined by a second series of walls. 5 Each second series of walls nests with the first series of walls to define the edge cleaning duct when the second section nests with the first section.

The first series of walls includes a first sidewall, a second sidewall and a first end wall. The second series of walls includes a third sidewall, a 10 fourth sidewall and a second end wall. The outlet is positioned between the third and fourth sidewalls adjacent the second end wall. The first series of walls may also include an intermediate wall between the first and second sidewalls spaced from the first end wall. The second end wall includes a projecting edge engaging the intermediate wall.

15 In accordance with yet another aspect of the present invention, a vacuum cleaner is provided. The vacuum cleaner includes a nozzle assembly and a canister assembly connected to the nozzle assembly. A suction generator is carried on one of the nozzle assembly and the canister assembly. A dirt collection vessel is also carried on one of the nozzle 20 assembly and the canister assembly. The suction generator draws air entrained with dirt through the nozzle assembly to the dirt collection vessel before exhausting clean air back to the environment.

The vacuum cleaner is characterized by the nozzle assembly having a housing including a main cavity and at least one intake opening in fluid

communication with the main cavity. Further, an edge cleaning duct has an inlet adjacent an edge of the housing and an outlet in fluid communication with the main cavity. The nozzle assembly of this vacuum cleaner also includes all the details already described.

5 In the following description there is shown and described a preferred embodiment of the invention simply by way of illustration of one of the modes best suited to carry out the invention. As it will be realized, the invention is capable of other different embodiments and its several details are capable of modification in various, obvious aspects all without 10 departing from the invention. Accordingly, the drawings and descriptions will be regarded as illustrative in nature and not as restrictive.

Brief Description of the Drawing Figures

15 The accompanying drawings incorporated in and forming a part of the specification, illustrate several aspects of the present invention, and together with the description serve to explain certain principles of the invention. In the drawings:

Figure 1 is a perspective view of an upright vacuum cleaner equipped with the nozzle assembly of the present invention;

20 Figure 2 is a perspective view of the bottom side of the first or outer section of the housing of the nozzle assembly showing the channel defined thereon that forms a portion of the edge cleaning duct;

Figure 3 is a perspective view of the second or inner section of the housing of the nozzle assembly including the second channel that forms a

portion of the edge cleaning duct;

Figure 4 is a partially cross sectional view showing the edge cleaning duct formed between the two sections of the housing including the discrete inlet and the outlet in fluid communication with the agitator 5 cavity.

Reference will now be made in detail to the present preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings.

#### Detailed Description of the Invention

10 Reference is now made to Figure 1 showing an upright vacuum cleaner 10 equipped with the nozzle assembly 14 of the present invention incorporating an edge cleaning duct along the front and adjacent each side thereof. The upright vacuum cleaner 10 includes a housing comprising the nozzle assembly 14 and a canister assembly 16 pivotally connected to 15 the nozzle assembly. The canister assembly 16 further includes a control handle 18 and a hand grip 20. A control switch 22 is provided for turning the vacuum cleaner on and off. Of course, electrical power is supplied to the vacuum cleaner 10 from a standard electrical wall outlet through an electrical cord (not shown).

20 A pair of rear wheels (not shown) are provided on a lower portion of the canister assembly 16 and a pair of front wheels (also not shown) are provided on the nozzle assembly 14. Together, these wheels function in a manner known in the art to support the vacuum cleaner for movement

across the floor. To allow for convenient storage of the vacuum cleaner 10, a foot latch 30 functions to lock the canister assembly 16 in an upright position as shown in Figure 1. When the foot latch 30 is released, the canister assembly 16 may be pivoted relative to the nozzle assembly 14 as 5 the vacuum cleaner 10 is manipulated back and forth to clean the floor.

In the present preferred embodiment, the canister assembly 14 includes a cavity adapted to receive and hold a dirt collection vessel 32. The dirt collection vessel 32 illustrated in Figure 1 is a removable dirt cup. That vessel 32 may or may not incorporate a cyclonic separation chamber. 10 Further it should be appreciated that while a dirt cup is shown, the vessel 32 could just as easily be a standard dust bag made from an appropriate porous filter material.

A suction generator, including a fan and drive motor assembly, is carried on the vacuum cleaner 10 and functions to generate a vacuum 15 airstream for drawing dirt and debris from a surface to be cleaned. The suction generator may be carried on the canister assembly 16 or the nozzle assembly 14 if desired. The nozzle assembly 14 includes a main or agitator cavity 38 that houses a pair of agitators (not shown) that are rotated by the motor of the suction generator or a separate, dedicated 20 motor relative to the nozzle assembly.

The nozzle assembly 14 also includes a pair of intake openings 37 in fluid communication with the agitator cavity 38 (see also Figure 2). The intake openings 37 are provided in fluid communication with the dirt collection vessel 32 by means of an airflow system including the flexible

hoses 40. During floor cleaning, the suction generator draws air and entrained dirt and debris through the intake openings 37 and the twin hoses 40 for delivery to the dirt collection vessel 32. Dirt and debris is collected in that vessel 32 in a manner well known in the art. The clean air 5 is then passed over the motor of the fan and motor assembly to provide cooling and then discharged through a HEPA filter (not shown) and an exhaust port 52 into the environment.

The inside surface of the first or outer section 60 of the nozzle assembly housing is illustrated in Figure 2. That housing section 60 10 includes a first channel 62 defined by a first series of walls including first sidewall wall 64, second sidewall 66 and end wall 68. As should be appreciated, one such channel 62 is provided on the interior surface of the first housing section 60 adjacent each side of the nozzle assembly 14. An intermediate wall 70 extends partially between the first and second 15 sidewalls 64, 66 spaced from the end wall 68. A gap 72 is provided at each end of the intermediate wall 70 adjacent the sidewalls 64, 66.

The upper or inner surface of the second housing section 74 is illustrated in Figure 3. A second channel 76 is defined on that surface by a second series of walls including a third sidewall 78, a fourth sidewall 80 20 and a second end wall 82. An outlet opening 84 is provided in the second channel 76 through the second housing section 74. Accordingly, the outlet 84 is positioned between the sidewalls 78, 80 and the end wall 82. As should further be appreciated from viewing Figure 3, two channels 76 are provided on the second housing section 74. Specifically, one channel

76 is provided adjacent each side of the housing section 74 and, therefore, the nozzle assembly 14.

As best illustrated in Figure 4, the second housing section 74 nests with the first housing section 60: that is, the first housing section fits over 5 the top of and around the second housing section. When properly nested, the first and second series of walls defining the first and second channels 62, 76 nest together adjacent each side of the nozzle assembly 14. More specifically, the second series of walls 78, 80 and 82 forming the second channel 76 on the left side of the nozzle assembly 14 nest in the first series 10 of walls 64, 66 and 68 forming the first channel 62 also on the left side of the nozzle assembly. More specifically, the sidewalls 78 and 80 extend through the gaps 72 and the end wall 82 engages the intermediate wall 70. This same nesting occurs between the sidewalls 78, 80, 82 and 64, 66 and 68 on the right side of the nozzle assembly. Together, the nested first and 15 second channels 62, 76 on the left side of the nozzle assembly 14 form a first edge cleaning duct 86 while the nested first and second channels 62, 76 on the right side of the nozzle assembly form a second edge cleaning duct (not shown in Figure 4).

As should be appreciated from viewing Figure 4, the edge cleaning 20 duct 86 includes an inlet 88 adjacent the front left edge of the nozzle assembly 14. As should be appreciated, that inlet 88 is discrete from the agitator cavity 38: that is, it is separated from the main or agitator cavity by the second housing section 74. In fact, as should be appreciated, the entire edge cleaning duct 86 is discrete from the agitator cavity 38 and is 25 separated thereby by the second housing section 74. Thus, the edge

cleaning duct 86 is defined by the upper surface 90 of the second housing section 74, the engaged sidewalls 64, 66 and 78, 80 of the two channels 62, 76 and the lower surface 92 of the first housing section 60.

In operation, the beater bars, wipers, brushes or tufts of bristles on 5 the rotary agitators beat dirt and debris from the nap of an underlying rug or carpet being cleaned. Simultaneously, the suction generator draws air through the intake openings 37 and the airflow system hoses 40 into the dirt collection vessel 32. That air is entrained with dirt and debris loosened by the rotary agitators. The dirt and debris is separated from the 10 airstream and collects in the dirt collection vessel 32. The clean air is then drawn into the fan of the fan and motor assembly and expelled by the fan to wash over the motor of the fan and motor assembly and provide desired cooling. Subsequently that clean air is subjected to final filtration by a HEPA filter before being exhausted through the exhaust port 52 into the 15 environment.

As air is drawn by the suction generator into the intake openings 37, from the agitator cavity 38, a low pressure area is created in the agitator cavity. As should be appreciated, the outlets 84 formed in the second housing section 74 provide fluid communication between the edge 20 cleaning ducts 86 and the agitator cavity 38. The low or negative pressure created in the agitator cavity 38 functions to draw air through the outlets 84 from the edge cleaning ducts 86. Thus air is pulled in through the inlets 88, through the edge cleaning ducts 86 and then through the outlets 84 into the agitator cavity 38. From there that air is drawn further into the 25 vacuum cleaner through the intake openings 37. Since an inlet 88 to an

edge cleaning duct 86 is provided adjacent each front corner of the nozzle assembly 14, good edge cleaning action is provided for sucking dirt and debris out of tight corners formed at the point where walls, baseboards and furniture meet the floor. Accordingly, these troublesome corners may be 5 cleaned more efficiently and effectively than has been possible in the past.

The foregoing description of a preferred embodiment of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Obvious modifications or variations are possible in light 10 of the above teachings. The embodiment was chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such 15 modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally and equitably entitled. The drawings and preferred embodiment do not and are not intended to limit the ordinary meaning of the claims and their fair and broad interpretation 20 in any way.